Field Test and Calibration Method for Temperature for the 61-310 and 61-312 DMMs

Most low cost instruments and Multimeters that measure temperature use Thermocouples {TC}.

Thermocouples are an inexpensive method of measuring temperature. TC can range in accuracy from 2% to as high as 20% depending on the purity of the metals and construction, so the better the accuracy the higher the cost of the TC. The TCs that come with low cost instruments are normally of low accuracy, typically 5% or more.

One nice fact is that regardless of the construction of the TC, if it is being used in normal environmental conditions the error can be compensated for.

One typically overlooked fact is that Water freezes at 32°F or 0°C and boils at 212°F or 100°C with very little error due to impurities of the water and barometric pressure.

This can provide a typical user an easy to construct calibration standard of suitable accuracy.

Fill one of those plastic thermal glasses that you have with crushed ice and add enough water to create the consistency of a slushy. At the same time bring a small pan of water to a boil. Remember that pure water will work best for this experiment.

There are TCs that are constructed to be submerged in water but most TCs that are packaged with low cost instruments come with a bead style TC which should not be used in liquids. If you have a bead type TC use something like a freezer bag or high temperature plastic wrap around the TC.

Now all you need to do is make the measurement.

For best accuracy during the measurement, slowly stir each batch of water as you are making the readings.

Following the steps below, you now have two reference values (the freezing and boiling points of water) which are 32 and 212 F or 0 and 100 C to allow you to do a two point calibration for each scale. If you have a calibrator, then you can choose to make more adjustments at different temperatures.

61-310 Temperature Performance Test:

Step	Range	Source	Reading
1	^{o}C	0 ^{o}C	-10 to 10
2	^{o}C	-20 ^{o}C	-31 to –9
3	^{o}C	400 ^{o}C	391 to 409
4	^{o}C	750 ^{o}C	721 to 779
5	^{o}F	-4 ^{o}F	-23 to 15
6	^{o}F	32 ^{o}F	12 to 52
7	^{o}F	1382 ^{o}F	1328 to 1436

^{o}C Calibration (Adjust VR2)

1. Set the rotary switch to the "^{o}**C** " position.
2. Set the output of the calibrator to 0 ^{o}C
3. Connect the calibrator Temperature output to the **V/Ω/Temp** and **COM** input terminals
4. Using a small flat-tipped screwdriver, adjust VR2 for a 0 ^{o}C +/- 1^{o}C (-1 to 1) display

^{o}F Calibration (Adjust VR3)

1. Set the rotary switch to the "^{o}**F** " position.
2. Set the output of the calibrator to 32 ^{o}F
3. Connect the calibrator Temperature output to the V/Temp and Com input
4. Using a small flat-tipped screwdriver adjust VR3 for a 32 ^{o}F +/- 1^{o}F (31 to 33) display

61-312 Temperature Performance Test:

Step	Range	Source	Reading
1	°C	0 °C	-4 to 4
2	°C	-20 °C	-24 to –16
3	°C	300 °C	293 to 307
4	°C	750 °C	722 to 778
5	°F	-4 °F	-8 to 0
6	°F	32 °F	27 to 36
7	°F	1382 °F	1336 to 1428

(D) °C Calibration (Adjust VR3)

5. Set the rotary switch to the "°**C** " position.
6. Set the output of the calibrator to 0 °C
7. Connect the calibrator Temperature output to the **V/Ω/Temp** and **COM** input terminals
8. Using a small flat-tipped screwdriver to adjust VR3 for a 0 °C +/- 1°C (-1 to 1) display

(E) °F Calibration (Adjust VR5)

5. Set the rotary switch to the "°**C** " position.
6. Set the output of the calibrator to 300 °C
7. Connect the calibrator Temperature output to the **V/Ω/Temp** and **COM** input
8. Using a small flat-tipped screwdriver adjust VR5 for a 300 °C +/- 1 °C (299 to 301) display

(F) °F Calibration (Adjust VR4)

1. Set the rotary switch to the "°**F** " position.
2. Set the output of the calibrator to 32 °F
3. Connect the calibrator Temperature output to the **V/Ω/Temp** and **COM** input
4. Using a small flat-tipped screwdriver adjust VR5 for a 32 °F +/- 1°F (31 to 33) display

(G) °F Calibration (Adjust VR6)

1. Set the rotary switch to the "°**F** " position.
2. Set the output of the calibrator to 572 °F
3. Connect the calibrator Temperature output to the **V/Ω/Temp** and **COM** input
4. Using a small flat-tipped screwdriver adjust VR6 for a 572 °F +/- 2°F (570 to 574) display